For Your Information

Physiography *is the study of the structure and phenomena of the earth's surface.*

Rivers that have carved a path through the bedrock of an area are ***incised****.*

Anticline *is an arching fold in layered rocks.*

Miocene *is the period in the Neogene lasting from 23 million years ago to 5 million years ago.*

The ***Columbia River Basalt Group****, composed of the Grand Ronde Basalt and the overlying Wanapuma and Saddle Mountains Basalt, comprises most of the aquifer system (USGS 1994).*

Neogene *is the geological period lasting from 23 million years ago to present day.*

Forage *is food for domestic animals, i.e. cattle, sheep, etc.*

Loess *is a windblown deposit of fine-grained silt or clay.*

Residuum *is unconsolidated weathered mineral material that accumulated as consolidated rock and disintegrated in place.*

Alluvium *is sedimentary material deposited by flowing water as in a delta or riverbed.*

Colluvium *is soil and/or rock fragments moved by creep, slide, local wash and deposited at the base of steep slopes.*

3.3 Soils and Geology

Diverse landforms and geologic features exist within the study area, which is in the Columbia Plateau ***physiographic*** province. The landscape within the plateau consists mostly of large and small hills with flat tops, extensive plateaus, ***incised*** rivers, and ***anticline*** ridges. The ***Miocene Columbia River Basalt Group*** underlies the region and is interbedded by ***Neogene*** terrestrial sediments (DNR, 1991).

The seismicity of the Columbia Plateau is relatively low compared to other regions in the Pacific Northwest. In 1936, the town of Milton-Freewater experienced an earthquake with a Richter scale magnitude of 5.75. This is the largest recorded earthquake known to have occurred in the Columbia Plateau (USDOE, 1999). Closer to the Hanford Site near the central part of the Columbia Plateau, an earthquake with a 4.4 Richter scale magnitude occurred in 1918 and again in 1973. These earthquakes were located near Othello, north of the Hanford Site, and are the largest recorded earthquakes that have occurred near the Hanford Site (USDOE, 1999).

Geologic hazards in the study area include steep slopes and erosion. Soil blowing and water erosion are the most active erosion processes due to the area's high relief, steepness of slope, and restricted available water capacity for the production of ***forage*** (USDA, 1984).

From the Schultz Substation at an elevation of 2,300 feet, Segments A, B_{NORTH}, and B_{SOUTH} would cross a broad plateau that extends to the Saddle Mountains in the northern portion of the YTC. Soils from the Schultz Substation to the Vantage Substation vary from shallow to deep, are well drained, and formed in a variety of parent materials including ***loess***, ***residuum***, ***alluvium***, and basaltic ***colluviums*** (Remote Sensing, 1998).

From the northern portion of the YTC, the landscape is characterized by ridges and valleys (the Saddle Mountains, Umtanum Ridge, and the Yakima Ridge) that were from the underlying basalt layers being folded and faulted. These ridges and valleys were further modified by glaciers and flooding (USDOD Army, 1996). Alluvial and wind-blown deposits of loess blanket the majority of the YTC.

From the Vantage Substation (elevation 900 feet) in Grant County, the area is generally smooth and southward sloping. The southward-sloping plain is deeply dissected and interrupted by the Saddle Mountains (approximate elevation 2,300 feet), and Crab Creek runs along its base (USDA, 1984). The Saddle Mountains are primarily made of basalt that has buckled into anticlines that trend in an east to west direction (Alt, 1994). These mountains had considerable faulting in their geologic past. The slopes to the south of the mountains are

gentle in comparison to the bold relief of the north-facing cliffs. North of the Vantage Substation the area is characterized by benches, terraces and ridge tops throughout areas of channeled scablands.

Soils in the Saddle Mountain range from deep and well drained to very shallow with rock outcrops. Deep soils are found mostly on the upland flat benches or on areas with rolling topography. Shallow soils are predominantly found on steep north- and south-facing slopes and ridge tops. The east-facing slopes tend to have deeper soils than the west-facing slopes, due to prevailing winds that deposit sand and silt on the leeward side of the hills (BLM, 1997).

From the top of the Saddle Mountains the Wahluke Slope trends southward to the Columbia River and the Hanford Site. This slope is relatively flat-bottomed. The Wahluke Slope's soils are deep, well drained, and nearly level. The soils were formed from a variety of parent materials including gravelly glacial outwash, sand derived from mixed sources, and ***lacustrine deposits*** (USDA, 1984).

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Lacustrine deposits *are material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.*

Low-relief plains and the Yakima Ridge dominate the Hanford Site. Several enormous floods modified the topography of the Hanford Site, when ice dams in western Montana and northern Idaho breached, emptied their entire contents, and spread across eastern Washington. This flooding, which is known as the Missoula Floods, occurred between 12,700 and 15,300 years ago (WSDNR website) and left sediments and a mix of topography that is now known as the Channeled Scablands (USDOE, 1999).